FACULDADE DE MEDICINA
UNIVERSIDADE DO PORTO

MESTRADO INTEGRADO EM MEDICINA

2017/2018

João Aníbal Sequeira Saraiva

Hepatitis B vaccination in peritoneal dialysis patients: Seroconversion evaluation

Vacinação contra a hepatite B em doentes em diálise peritoneal: Avaliação da seroconversão

março, 2018

João Aníbal Sequeira Saraiva

Hepatitis B vaccination in peritoneal dialysis patients: Seroconversion evaluation

Vacinação contra a hepatite B em doentes em diálise peritoneal: Avaliação da seroconversão

Mestrado Integrado em Medicina

Área: Nefrologia

Tipologia: Dissertação

Trabalho efetuado sob a Orientação de:

Dra. Ana Patrícia Corte Real do Nascimento e Oliveira

Trabalho organizado de acordo com as normas da revista:

Peritoneal Dialysis International

março, 2018

U.PORTO

FMUP FACULDADE DE MEDICINA UNIVERSIDADE DO PORTO

Projeto de Opção do 6º ano - DECLARAÇÃO DE INTEGRIDADE

Eu, João Aníbal Sequeira Saraiva, abaixo assinado, nº mecanográfico 201207558, estudante do 6º ano do Ciclo de Estudos Integrado em Medicina, na Faculdade de Medicina da Universidade do Porto, declaro ter atuado com absoluta integridade na elaboração deste projeto de opção.

Neste sentido, confirmo que **NÃO** incorri em plágio (ato pelo qual um indivíduo, mesmo por omissão, assume a autoria de um determinado trabalho intelectual, ou partes dele). Mais declaro que todas as frases que retirei de trabalhos anteriores pertencentes a outros autores, foram referenciadas, ou redigidas com novas palavras, tendo colocado, neste caso, a citação da fonte bibliográfica.

Faculdade de Medicina da Universidade do Porto, 22/03/2018

Assinatura conforme cartão de identificação:

João Aníbal Sequeira Saraiva

U.PORTO

FMUP FACULDADE DE MEDICINA UNIVERSIDADE DO PORTO

Projecto de Opção do 6º ano – DECLARAÇÃO DE REPRODUÇÃO

NOME

João Aníbal Sequeira Saraiva

NÚMERO DE ESTUDANTE	E-MAIL
201207558	js.saraiva@outlook.pt

DESIGNAÇÃO DA ÁREA DO PROJECTO

Nefrologia

TÍTULO DISSERTAÇÃO

Hepatitis B vaccination in peritoneal dialysis patients: Seroconversion evaluation

ORIENTADOR

Ana Patrícia Corte Real do Nascimento e Oliveira

COORIENTADOR (se aplicável)

ASSINALE APENAS UMA DAS OPÇÕES:

É AUTORIZADA A REPRODUÇÃO INTEGRAL DESTE TRABALHO APENAS PARA EFEITOS DE INVESTIGAÇÃO, MEDIANTE DECLARAÇÃO ESCRITA DO INTERESSADO, QUE A TAL SE COMPROMETE.	☐
É AUTORIZADA A REPRODUÇÃO PARCIAL DESTE TRABALHO (INDICAR, CASO TAL SEJA NECESSÁRIO, Nº MÁXIMO DE PÁGINAS, ILUSTRAÇÕES, GRÁFICOS, ETC.) APENAS PARA EFEITOS DE INVESTIGAÇÃO, MEDIANTE DECLARAÇÃO ESCRITA DO INTERESSADO, QUE A TAL SE COMPROMETE.	☐
DE ACORDO COM A LEGISLAÇÃO EM VIGOR, (INDICAR, CASO TAL SEJA NECESSÁRIO, Nº MÁXIMO DE PÁGINAS, ILUSTRAÇÕES, GRÁFICOS, ETC.) NÃO É PERMITIDA A REPRODUÇÃO DE QUALQUER PARTE DESTE TRABALHO.	☒

Faculdade de Medicina da Universidade do Porto, 22/03/2018

Assinatura conforme cartão de identificação: João Aníbal Sequeira Saraiva

DEDICATÓRIA

Aos meus pais…

Original Article

Corresponding Author:

João Aníbal Sequeira Saraiva
Faculty of Medicine, University of Porto, Alameda Prof. Hernâni Monteiro, 4200- 319 Porto
E-mail: js.saraiva@outlook.pt

Word count: 2360 words

Table and Figure Count: 3 tables and 2 figures

Hepatitis B Vaccination in Peritoneal Dialysis Patients:

Seroconversion evaluation

João Saraiva[1], BSc, Catarina Meng[1, 2], MD, Ana Oliveira[1, 2], MD

[1]Faculty of Medicine, University of Porto, Porto, Portugal
[2]Department of Nephrology, Centro Hospitalar São João, Porto, Portugal

ABSTRACT

***Background*:** Hepatitis B virus (HBV) vaccination is recommended for all susceptible dialysis patients. Patients on chronic dialysis exhibit diminished seroconversion rates to HBV vaccine. Multiple factors have been associated with a favourable response to HBV vaccination in hemodialysis (HD) patients; nevertheless, studies with such endpoint concerning peritoneal dialysis (PD) patients are sparse. We aimed to find any factors associated with an immune response in a PD population.

***Methods*:** We retrospectively evaluated seroconversion after HBV vaccination in a PD population submitted to this vaccine.

***Results*:** Thirty five end-stage renal disease (ESRD) adult patients on maintenance PD were included – 18 patients who completed a primary vaccination series during PD (group V1) and 17 patients who were submitted to a rechallenge immunization while on PD (group V2). Older patients, defined as age superior to 50 years old, had a lower seroconversion rate (52.4% vs. 92.9%) ($p = 0.023$). Seroconversion to HBV vaccine was independent from gender, weight, body mass index, smoking, diabetes, chronic kidney disease etiology, previous blood transfusion, renal transplant, PD modality, PD adequacy, residual renal function, peritoneal equilibration test classification, number of peritonitis, time on PD prior to vaccination, albumin and haemoglobin levels, recombinant human erythropoietin injection, immunosuppressant therapy, vitamin D administration and antidepressants intake. Among responders, hepatitis B surface antibody titres of younger patients significantly exceeded those of older patients ($p = 0.01$).

***Conclusions*:** Only older age was significantly associated with an impaired immune response to HBV vaccination in ESRD patients on maintenance PD.

KEY WORDS: Peritoneal dialysis; hepatitis B virus; vaccination; seroconversion.

INTRODUCTION

End-stage renal disease (ESRD) is associated with a compromised immune defence due to T-cell dysfunction (1), which increases susceptibility to infectious diseases (2).

Hepatitis B virus (HBV) infection is an ubiquitous chronic viral infection with considerable morbidity and financial burden, and its prevalence in ESRD patients undergoing long-term dialysis is not negligible (3, 4). These patients are more prone to become HBV chronic carriers, increasing their risk of fulminant hepatitis, chronic liver disease, liver cirrhosis or hepatocellular carcinoma (5).

In order to prevent HBV infection, hygienic precautions must be implemented and the Advisory Committee on Immunization Practices recommends hepatitis B vaccination for all susceptible dialysis patients.

Besides greater predisposition to infections, ESRD patients exhibit diminished seroconversion rates to vaccines (6); in fact, comparing with the non-uremic population, a lower number of patients going through chronic dialysis develops protective serum hepatitis B surface antibody (anti-HBs) levels, and even among responders, anti-HBs titres tend to be low and decline faster (7).

There are two major dialysis modalities, hemodialysis (HD) and peritoneal dialysis (PD), with equal outcomes regarding quality of life and mortality (8, 9). There are many studies trying to find a favourable response to HBV vaccination in HD patients. The factors already associated with it are: lower age (4), female gender (3, 10), non-obese (11), non-diabetic (12), absent human immunodeficiency virus infection (13) or hepatitis C virus infection (14), increased length of time on dialysis prior to receipt of vaccine (15), adequate nutritional status (16), treatment with recombinant human erythropoietin (rHuEPO) (17), no history of blood transfusion (6) or renal transplant (18), haemoglobin >11g/dL (1) and no depression (19). However, there is a lack of information on the seroconversion after HBV vaccination in PD patients.

In this study we aimed to find any factors associated with an immune response in a PD population.

METHODS

PATIENTS AND EXCLUSION CRITERIA

This was a single centre retrospective study performed with ESRD adult patients on maintenance PD followed on a routine basis at Centro Hospitalar São João (Porto, Portugal) peritoneal dialysis unit at the beginning of January 2017. We excluded patients who were not vaccinated for HBV while on PD, and those who were positive for either hepatitis B surface antigen or anti-hepatitis B core. Patients were categorized into two groups: (V1) those who completed a primary vaccination series; (V2) those who received a rechallenge immunization.

DATA ACQUISITION

The Ethics Committee of Centro Hospitalar São João approved the study protocol and waived the requirement for patient informed consent. The following variables were recorded for all patients: age, gender, height, weight, body mass index (BMI), chronic kidney disease (CKD) etiology, history of renal transplant, smoking, diabetes and previous blood transfusions; dialysis modality (continuous ambulatory PD [CAPD] or automated PD [APD]), dialysis adequacy, residual renal function (RRF) and peritoneal equilibration test (PET) classification at the time of vaccination; number of peritonitis and length of time on dialysis prior to vaccination; serum albumin and haemoglobin levels just before and 1 year after vaccination; anti-HBs titre right before initiating and at least 2 months after completing immunization schedule; rHuEPO injection and antidepressants, vitamin D or immunosuppressant drugs intake during vaccination.

END-POINT OF INTEREST

Our purpose was to find whether any of the previously mentioned variables were associated with HBV vaccine-induced seroprotection in PD patients; those with an anti-HBs titre ≥ 10 IU/L were classified as responders – i.e. seroprotected.

STATISTICAL ANALYSIS

For statistical analysis, SPSS IBM version 25 (IBM Corp., Armonk, NY) was used. We used the Fisher's exact test to identify differences in categorical variables, and the Mann-Whitney test to identify differences in numerical variables. Two-tailed p values of less than 0.05 were considered statistically significant.

RESULTS

We retrospectively collected data from 91 ESRD adult patients on maintenance PD. After exclusion of patients who were not vaccinated for HBV while on PD, and who were positive for either hepatitis B surface antigen or anti-hepatitis B core, we obtained a total of 35 patients - 18 patients who completed a primary vaccination series during PD (group V1) and 17 patients who were submitted to a rechallenge immunization while on PD (group V2).

Patients' characteristics are summarized in table 1. Age ranged from 31 to 82 years old with a median of 54 years old, distribution by genre was quite balanced (51% male and 49% female) and most were overweight (66%). Hypertension, diabetes or chronic glomerulonephritis explained half of the cases of CKD. CAPD was the most frequent dialysis modality (60%) and the majority of patients had a satisfactory dialysis adequacy (94%), were given rHuEPO (57%) and were classified as high-average or high transporters (88%) according to their PET. Total seroconversion rate was 69%.

Tables 2 and 3 compare responders to non-responders in relation to numerical and categorical variables, respectively. Non-responders were statistically significantly older as

compared to responders (60 vs. 50 years old; $p = 0.014$) (table 2). Older patients, defined as age superior to 50 years old, had a lower seroconversion rate than younger patients (52% vs. 93%; $p = 0.023$) (figure 1). There were no significant differences between responders and non-responders with respect to all the remaining variables, namely gender, bodyweight, BMI, smoking, diabetes, previous blood transfusion, renal transplant, PD modality, time on PD prior to vaccination, PD adequacy, PET classification, RRF, number of peritonitis, haemoglobin or albumin levels, and rHuEPO, immunosuppressant, vitamin D or antidepressant therapy. Nonetheless, diabetic patients were less likely to respond than non-diabetic (37.5% vs. 77.8%) and APD patients exhibited a greater seroconversion rate (85.7%) as compared to CAPD users (57.1%); however, neither of these differences were significant ($p = 0.077$ and $p = 0.137$, respectively).

Among responders, older patients had statistically significantly inferior anti-HBs titres than younger patients (31 vs 451 IU/L; $p = 0.01$) (figure 2).

DISCUSSION

The findings from this study suggest that older PD patients, defined as age superior to fifty years old, are less likely to achieve protective anti-HBs titres after vaccination, which is in agreement with previous data from multiple studies (4, 20, 21); further, we found that older responders exhibit lower anti-HBs levels. Given the consistently lower seroconversion rate and anti-HBs titres among older patients, our interpretation of these results is that older age in a PD population is significantly associated with an impaired immune response to HBV vaccination. Indeed, both immune system dysregulation during ESRD and immunosenescence have been linked to insufficient protection following vaccination (2, 22).

Apart from age, no other factor had a statistically significant effect on immune response to HBV vaccine; nonetheless, there was a pronounced trend for diabetes to be negatively associated with seroconversion (62.5% non-responders among diabetics compared with 28.6%

non-responders among non-diabetics, p = 0.077) which is biologically plausible. In fact, a meta-analysis by Fabrizi *et al.* (12) showed that diabetes mellitus is significantly associated with an impaired HBV immunoprophylaxis both in HD and CAPD patients. We argue that the absence of a statistically significant association between diabetes and immune response may be related to insufficient statistical power.

The National Kidney Foundation guidelines recommend PD adequacy, measured as total Kt/V, to be at least 1.7 per week. Studies comparing PD adequacy between responders and non-responders to HBV vaccine reported inconsistent results: Dervisoglu *et al.* (23) did not find significant differences, whereas Svac *et al.* (24) found a significant difference in response rate between patients with a weekly Kt/V greater than 1.7 and patients with a weekly Kt/V below 1.7 (71% and 8%, respectively); our study accomplished similar seroconversion rates to that described by Svac. *et al* (73% with a Kt/V greater than 1.7 and 0% with a Kt/V below 1.7), but failed to reveal a statistically significant difference between groups, possibly reflecting the fact that only two patients had low PD adequacy.

We did not find any studies evaluating seroconversion rate according to PET classification; our results show no statistical difference between high and low transporters (*p = 0.580)*.

Previous work (3) has shown a significant sex bias in seroconversion after HBV vaccine in HD patients, but not in PD patients. Identically, we did not find any link between gender and immune response, likewise Khan *et al.* (5).

Former researches linked obesity to an unsatisfactory HBV immunoprophylaxis, either in non-dialysis (25), or HD patients (11). Khan *et al.* (5), in their meta-analysis, did not observe a significant weight difference between PD responders and non-responders. Accordingly, our results suggest that neither weight, nor BMI have an effect on seroconversion after HBV vaccine (*p = 0.929* and *p = 0.309*, respectively), despite a larger proportion of responders among patients with a BMI below 25 kg/m^2 (83% vs. 61%).

Serum albumin levels have previously been reported to positively influence immune reactivity to HBV vaccine in HD (16) patients. As a matter of fact, Kara *et al.* (26) stated that failure to reach protective anti-HBs titres was significantly more frequent (87.5%) among HD

patients who had albumin levels between 3 and 3.5 g/dL, compared to albumin levels of at least 4.5 g/dL. However, this was not the case in our study, which is in line with former data (27, 28).

Smoking has been shown to suppress the immune system in CKD patients (29) and to adversely affect antibody formation upon hepatitis B vaccination (30). Still, in the present study, smoking status had no influence on immune response to HBV vaccine.

Contradicting our results, HBV vaccine was found to be weakly immunogenic in renal transplant recipients by previous studies (18). Such disparity may be due to extremely different sample sizes, since our study only comprised three transplant recipients. Moreover, comparing converters to non-converters, there was no difference concerning immunosuppressive therapy, which is in agreement with Khan *et al.* (5)

In the current study, previous blood transfusions, haemoglobin levels and rHuEPO therapy did not predict response to HBV vaccination. Nevertheless, Bender *et al.* (31) showed that transfused patients on HD exhibit decreased absolute lymphocyte counts; still, most changes in T lymphocyte subsets happen beyond five transfusions (31) and we just evaluated blood transfusion as a dichotomous variable. In regard to the effect of both haemoglobin levels and rHuEPO therapy, literature is controversial: Al Saran *et al.* (32) did not find any link between haemoglobin levels and immunization, however Hassan *et al.* (1) mentioned a better immune response to HBV vaccine in CKD and HD patients with haemoglobin levels higher than 11 gr/dL, perhaps translating higher EPO levels; indeed, some authors suggested that EPO might enhance B cell immunoglobulin production and proliferation (33) and directly improve immune reactivity among dialysis patients (17), but a meta-analysis (34) did not show an association between immune response to HBV vaccine and rHuEPO therapy in patients on dialysis, which mimics our results.

Concerning dialysis modality, a robust analysis (6) showed no link between dialysis mode (either PD, or HD) and seroresponse rate to HBV vaccine, but we couldn't find any studies comparing CAPD with APD in relation to the effectiveness of HBV immunoprophylaxis. Our findings suggest a greater response rate among APD users (86% vs. 57%), but this difference was not significant ($p = 0.137$), perhaps encouraging further studies with larger sample sizes.

The impact of RRF on HBV immunization has already been addressed (35) with similar results, that is, no difference between responders and non-responders.

According to previous work (36), peritonitis rate does not differ among responders and non-responders to HBV vaccine (0.46/year and 0.33/year, respectively) and the present study also did not find any association between peritonitis burden and immune response. Nonetheless, it should be emphasized that only eight of our patients had peritonitis, none of them having more than two peritonitis episodes by the time of vaccination.

Likewise Khan *et al.* (5), we did not observe any link between duration of PD prior to vaccination and seroconversion.

In CKD patients, vitamin D deficiency is highly prevalent and negatively influences immune response to HBV vaccine (37). Notably, vitamin D receptors are widely expressed in immune system (38) and such vitamin has been linked with both innate and adaptive immune responses (39). However, a study comprising both HD and PD patients (39) showed that vitamin D levels are not significantly different among responders and non-responders to HBV vaccine. Once we didn´t have serum vitamin D measurements, we decided to compare vitamin D administration in seroconverters and non-converters. Vitamin D intake was not significantly different between both groups in the current study, which seems to agree with results provided by Jhorawat *et al.* (39).

Afsar *et al.* (19) reported a significant negative association between depression and anti-HBs titres in HD patients. This has been partially attributed to an immunological dysregulation, mainly affecting the number and function of monocytes/macrophages and lymphocytes (40). In the present study, once again we considered need for antidepressant therapy as a marker of depression. Seroconversion rate was much lower among antidepressant users than non-users (33% vs. 72%, respectively), but such discrepancy was not statistically significant; however, one must be cautious when interpreting these results, since there were only three antidepressant users in our PD sample.

Some limitations of our study must be addressed. First, our research is a retrospective study with its inherent disadvantages, namely certain unclear exposure status, lack of pertinent

medical records and impossibility to infer causality between older age and weakened immune response. Second, the small size of the PD sample precluded appliance of parametric tests and comparison of seroconversion rates between groups V1 and V2; still, our sample is made of 35 patients, which is line with previous analysis performed with 40 PD patients by Svac *et al.* (24) and 32 patients by Dacko & Holley (35). Third, our findings need further validation using a multivariate model to adjust for potential confounding variables.

The exclusive enrolment of PD patients and the assessment of seroconversion rate in an APD population are strengths of this study. We also would like to highlight the attempt to find an association between PET classification and seroconversion to HBV vaccination.

CONCLUSIONS

In conclusion, the present results highlight a significant association between older age and an impaired immune response to HBV vaccine among ESRD patients on maintenance PD. Further research with larger PD samples is needed to more accurately assess which other factors might be associated with HBV immunization.

DISCLOSURES

The authors have no financial conflicts of interest to declare.

REFERENCES

1. Hassan K, Shternberg L, Alhaj M, Giron R, Reshef R, Barak M, et al. The effect of erythropoietin therapy and hemoglobin levels on the immune response to Engerix-B vaccination in chronic kidney disease. Renal failure. 2003;25(3):471-8.
2. Descamps-Latscha B, Herbelin A, Nguyen AT, Zingraff J, Jungers P, Chatenoud L. Immune system dysregulation in uremia. Seminars in nephrology. 1994;14(3):253-60.
3. Khedmat H, Aghaei A, Ghamar-Chehreh ME, Agah S. Sex bias in response to hepatitis B vaccination in end-stage renal disease patients: Meta-analysis. World journal of nephrology. 2016;5(1):115-24.
4. Fabrizi F, Martin P, Dixit V, Bunnapradist S, Dulai G. Meta-analysis: the effect of age on immunological response to hepatitis B vaccine in end-stage renal disease. Alimentary pharmacology & therapeutics. 2004;20(10):1053-62.
5. Khan AN, Bernardini J, Rault RM, Piraino B. Low seroconversion with hepatitis B vaccination in peritoneal dialysis patients. Peritoneal dialysis international : journal of the International Society for Peritoneal Dialysis. 1996;16(4):370-3.
6. Fabrizi F, Dixit V, Bunnapradist S, Martin P. Meta-analysis: the dialysis mode and immunological response to hepatitis B virus vaccine in dialysis population. Alimentary pharmacology & therapeutics. 2006;23(8):1105-12.
7. Fabrizi F, Martin P. Hepatitis B vaccine and dialysis: current issues. The International journal of artificial organs. 2001;24(10):683-94.
8. Zazzeroni L, Pasquinelli G, Nanni E, Cremonini V, Rubbi I. Comparison of Quality of Life in Patients Undergoing Hemodialysis and Peritoneal Dialysis: a Systematic Review and Meta-Analysis. Kidney & blood pressure research. 2017;42(4):717-27.
9. Wong B, Ravani P, Oliver MJ, Holroyd-Leduc J, Venturato L, Garg AX, et al. Comparison of Patient Survival Between Hemodialysis and Peritoneal Dialysis Among Patients Eligible for Both Modalities. American journal of kidney diseases : the official journal of the National Kidney Foundation. 2017.

10. Stevens CE, Szmuness W, Goodman AI, Weseley SA, Fotino M. Hepatitis B vaccine: immune responses in haemodialysis patients. Lancet (London, England). 1980;2(8206):1211-3.
11. Asan A, Demirhan H, Sorkun HC, Ozkan S, Aydin M, Akin D, et al. Factors affecting responsiveness to hepatitis B immunization in dialysis patients. International urology and nephrology. 2017;49(10):1845-50.
12. Fabrizi F, Dixit V, Martin P, Messa P. Meta-analysis: the impact of diabetes mellitus on the immunological response to hepatitis B virus vaccine in dialysis patients. Alimentary pharmacology & therapeutics. 2011;33(7):815-21.
13. Ahuja TS, Kumar S, Mansoury H, Rodriguez H, Kuo YF. Hepatitis B vaccination in human immunodeficiency virus-infected adults receiving hemodialysis. Kidney international. 2005;67(3):1136-41.
14. Navarro JF, Teruel JL, Mateos ML, Marcen R, Ortuno J. Antibody level after hepatitis B vaccination in hemodialysis patients: influence of hepatitis C virus infection. American journal of nephrology. 1996;16(2):95-7.
15. Steketee RW, Ziarnik ME, Davis JP. Seroresponse to hepatitis B vaccine in patients and staff of renal dialysis centers, Wisconsin. American journal of epidemiology. 1988;127(4):772-82.
16. Fernandez E, Betriu MA, Gomez R, Montoliu J. Response to the hepatitis B virus vaccine in haemodialysis patients: influence of malnutrition and its importance as a risk factor for morbidity and mortality. Nephrology, dialysis, transplantation : official publication of the European Dialysis and Transplant Association - European Renal Association. 1996;11(8):1559-63.
17. Sennesael JJ, Van der Niepen P, Verbeelen DL. Treatment with recombinant human erythropoietin increases antibody titers after hepatitis B vaccination in dialysis patients. Kidney international. 1991;40(1):121-8.

18. Jacobson IM, Jaffers G, Dienstag JL, Tolkoff-Rubin NE, Cosimi AB, Delmonico F, et al. Immunogenicity of hepatitis B vaccine in renal transplant recipients. Transplantation. 1985;39(4):393-5.
19. Afsar B, Elsurer R, Eyileten T, Yilmaz MI, Caglar K. Antibody response following hepatitis B vaccination in dialysis patients: does depression and life quality matter? Vaccine. 2009;27(42):5865-9.
20. Yang S, Tian G, Cui Y, Ding C, Deng M, Yu C, et al. Factors influencing immunologic response to hepatitis B vaccine in adults. Scientific reports. 2016;6:27251.
21. Chin AI. Hepatitis B virus vaccine response in hemodialysis: baseline patient characteristics. Hemodialysis international International Symposium on Home Hemodialysis. 2003;7(4):296-303.
22. Weinberger B, Herndler-Brandstetter D, Schwanninger A, Weiskopf D, Grubeck-Loebenstein B. Biology of immune responses to vaccines in elderly persons. Clinical infectious diseases : an official publication of the Infectious Diseases Society of America. 2008;46(7):1078-84.
23. Dervisoglu E, Simsek M, Yilmaz A. Antibody response following hepatitis B vaccination in peritoneal dialysis patients: does normalized urea clearance matter? Clinics (Sao Paulo, Brazil). 2011;66(9):1559-62.
24. Svac J, Skladany L, Sekerkova Z, Javorsky P, Leskova L, Mizla P, et al. Peritoneal dialysis is the better therapy choice for successful anti-hepatitis B vaccination. Advances in peritoneal dialysis Conference on Peritoneal Dialysis. 2005;21:151-3.
25. Fan W, Chen XF, Shen C, Guo ZR, Dong C. Hepatitis B vaccine response in obesity: A meta-analysis. Vaccine. 2016;34(40):4835-41.
26. Kara IH, Yilmaz ME, Suner A, Kadiroglu AK, Isikoglu B. The evaluation of immune responses that occur after HBV infection and HBV vaccination in hemodialysis patients. Vaccine. 2004;22(29-30):3963-7.

27. Ghamar-Chehreh ME, Agah S, Khedmat H, Aghaei A, Alavian SM. Serum albumin level as an indicator of response to Hepatitis B vaccination in dialysis patients: A systematic review and meta-analysis. Caspian journal of internal medicine. 2017;8(4):250-7.
28. Liu YL, Kao MT, Huang CC. A comparison of responsiveness to hepatitis B vaccination in patients on hemodialysis and peritoneal dialysis. Vaccine. 2005;23(30):3957-60.
29. Duvenci Birben O, Akcay S, Sezer S, Sirvan S, Haberal M. Effect of Smoking on Peripheral Blood Lymphocyte Subsets of Patients With Chronic Renal Failure. Experimental and clinical transplantation : official journal of the Middle East Society for Organ Transplantation. 2016;14(Suppl 3):91-4.
30. Winter AP, Follett EA, McIntyre J, Stewart J, Symington IS. Influence of smoking on immunological responses to hepatitis B vaccine. Vaccine. 1994;12(9):771-2.
31. Bender BS, Curtis JL, Nagel JE, Chrest FJ, Kraus ES, Briefel GR, et al. Analysis of immune status of hemodialyzed adults: association with prior transfusions. Kidney international. 1984;26(4):436-43.
32. Al Saran K, Sabry A, Al Halawany Z, Ismail M. Factors affecting response to hepatitis B vaccine among hemodialysis patients in a large Saudi Hemodialysis Center. Saudi journal of kidney diseases and transplantation : an official publication of the Saudi Center for Organ Transplantation, Saudi Arabia. 2014;25(1):185-91.
33. Kimata H, Yoshida A, Ishioka C, Masuda S, Sasaki R, Mikawa H. Human recombinant erythropoietin directly stimulates B cell immunoglobulin production and proliferation in serum-free medium. Clinical and experimental immunology. 1991;85(1):151-6.
34. Fabrizi F, Dixit V, Martin P, Messa P. Erythropoietin use and immunogenicity of hepatitis B virus vaccine in chronic kidney disease patients: a meta-analysis. Kidney & blood pressure research. 2012;35(6):504-10.
35. Dacko C, Holley JL. The influence of nutritional status, dialysis adequacy, and residual renal function on the response to hepatitis B vaccination in peritoneal dialysis patients. Advances in peritoneal dialysis Conference on Peritoneal Dialysis. 1996;12:315-7.

36. Holley JL. Does the response to hepatitis B vaccination predict CAPD-associated infections? Advances in peritoneal dialysis Conference on Peritoneal Dialysis. 1996;12:218-20.
37. Zitt E, Sprenger-Mahr H, Knoll F, Neyer U, Lhotta K. Vitamin D deficiency is associated with poor response to active hepatitis B immunisation in patients with chronic kidney disease. Vaccine. 2012;30(5):931-5.
38. Veldman CM, Cantorna MT, DeLuca HF. Expression of 1,25-dihydroxyvitamin D(3) receptor in the immune system. Archives of biochemistry and biophysics. 2000;374(2):334-8.
39. Jhorawat R, Jain S, Pal A, Nijhawan S, Beniwal P, Agarwal D, et al. Effect of vitamin D level on the immunogenicity to hepatitis B vaccination in dialysis patients. Indian journal of gastroenterology : official journal of the Indian Society of Gastroenterology. 2016;35(1):67-71.
40. Kronfol Z. Immune dysregulation in major depression: a critical review of existing evidence. The international journal of neuropsychopharmacology. 2002;5(4):333-43.

TABLE 1

Peritoneal dialysis patients' description

Characteristic	*PD patients (n = 35)*
Age, yr	54 (45-65)
≤50, *n*	14 (40.0%)
>50, *n*	21 (60.0%)
Gender	
Male, *n*	18 (51.4%)
Female, *n*	17 (48.6%)
Weight, kg	68.4 (62.3-68.7)
BMI, kg/m^2	27 (22-30)
Smoking, *n*	9 (25.7%)
Diabetes, *n*	8 (22.9%)
Blood transfusion, *n*	13 (37.1%)
CKD etiology	
ADPKD, *n*	1 (2.9%)
Amyloidosis, *n*	1 (2.9%)
CAF, *n*	2 (5.7%)
CGN, *n*	5 (14.3%)
Diabetes, *n*	6 (17.1%)
Hypertension, *n*	7 (20.0%)
Obstructive uropathy, *n*	2 (5.7%)
Undetermined, *n*	11 (31.4%)
Renal transplant, *n*	3 (8.6%)
Time on PD pre-vaccination, *months*	2 (1-13)
PD modality	
APD, *n*	14 (40.0%)
CAPD, *n*	21 (60.0%)
PD adequacy, Kt/V	2.3 (1.8-2.7)
PET classification	
Low to low-average, *n*	4 (11.8%)
High-average to high, *n*	30 (88.2%)
RRF, mL/min	5.36 (3.86-8.67)
Peritonitis	0 (0-1)
Haemoglobin, g/dL	
Before vaccination	11.9 (10.8-12.6)
After vaccination	11.4 (10.4-12.4)
Albumin, g/L	
Before vaccination	39.1 (35.6-41.3)
One year after vaccination	38.6 (35.3-41.0)
On rHuEPO, *n*	20 (57.1%)
On IST, *n*	3 (8.6%)
On vitamin D, *n*	18 (51.4%)
On antidepressants, *n*	3 (8.6%)
Responders, *n*	24 (68.6%)

Data are expressed as median (IQR) or n (%).

BMI = body mass index; CKD = chronic kidney disease; ADPKD = autosomal dominant polycystic kidney disease; CAF = chronic allograft failure; CGN = chronic glomerulonephritis; PD = peritoneal dialysis; APD = automated PD; CAPD = continuous ambulatory PD; PET = peritoneal equilibration test; rHuEPO = recombinant human erythropoietin; IST = immunosuppressant therapy.

TABLE 2

Comparison of Responders and Non-responders – numerical variables

Characteristic	*Responders* (*n* = 24)	*Non-responders* (*n* = 11)	*p Value*
Age, yr	50 (43-56)	60 (54-68)	0.014
Weight, kg	68.6 (62.3-78.6)	65 (62.3-79.3)	0.929
BMI, kg/m^2	26 (22-29)	27 (24-32)	0.309
Time on PD pre-vaccination, months	4 (1-14)	1 (0-13)	0.367
PD adequacy, Kt/V	2.3 (1.8-2.8)	2.3 (2.0-2.6)	0.669
RRF, mL/min	5.45 (3.76-7.98)	4.98 (3.86-10.72)	0.644
Peritonitis	0 (0-1)	0 (0-0)	0.302
Haemoglobin, g/dL			
Before vaccination	11.7 (10.8-12.6)	12.0 (11.0-13-0)	0.581
One year after vaccination	11.5 (10.5-12.6)	11.3 (10.4-11.9)	0.892
Albumin, g/L			
Before vaccination	38.8 (36.6-41.2)	39.6 (34.7-41.3)	0.817
One year after vaccination	38.4 (36.2-41.0)	40.4 (35.3-41.0)	0.931

Data are expressed as median (IQR).

BMI = body mass index; PD = peritoneal dialysis; RRF = residual renal function.

TABLE 3

Comparison of Responders and Non-responders – categorical variables

Characteristic	*Responders* (*n* = 24)	*Non-responders* (*n* = 11)	*p Value*
Age, yr			0.023
≤50	13 (92.9)	1 (7.1)	
>50	11 (52.4)	10 (47.6)	
Gender			0.632
Male	13 (72.2)	5 (27.8)	
Female	11 (64.7)	6 (35.3)	
BMI, kg/m^2			0.259
<25	10 (83.3)	2 (16.7)	
≥25	14 (60.9)	9 (39.1)	
Smoking	17 (70.8)	7 (29.2)	0.685
Diabetes	3 (37.5)	5 (62.5)	0.077
Blood transfusion	9 (69.2)	4 (30.8)	1.000
Renal transplant	3 (100)	0 (0)	0.536
PD modality			0.137
APD	12 (85.7)	2 (14.3)	
CAPD	12 (57.1)	9 (42.9)	
PD adequacy, Kt/V			0.092
<1.7	0 (0)	2 (100)	
≥1.7	24 (72.7)	9 (27.3)	
PET classification			0.580
Low to low-average	2 (50)	2 (50)	
High-average to high	21 (70)	9 (30)	
Haemoglobin, g/dL			
Before vaccination			0.861
<10	2 (66.7)	1 (33.3)	
10-12	14 (73.7)	5 (26.3)	
>12	8 (61.5)	5 (38.5)	
One year after vaccination			0.434
<10	4 (80.0)	1 (20.0)	
10-12	8 (57.1)	6 (42.9)	
>12	9 (81.8)	2 (18.2)	
On rHuEPO	13 (65.0)	7 (35.0)	0.721
On IST	3 (100)	0 (0)	0.536
On vitamin D	11 (61.1)	7 (38.9)	0.328
On antidepressants	1 (33.3)	2 (66.7)	0.227

Data are expressed as n (%). A 2-tailed value of $p < 0.05$ was considered significant.

BMI = body mass index; PD = peritoneal dialysis; APD = automated PD; CAPD = continuous ambulatory PD; PET = peritoneal equilibration test; rHuEPO = recombinant human erythropoietin; IST = immunosuppressant therapy.

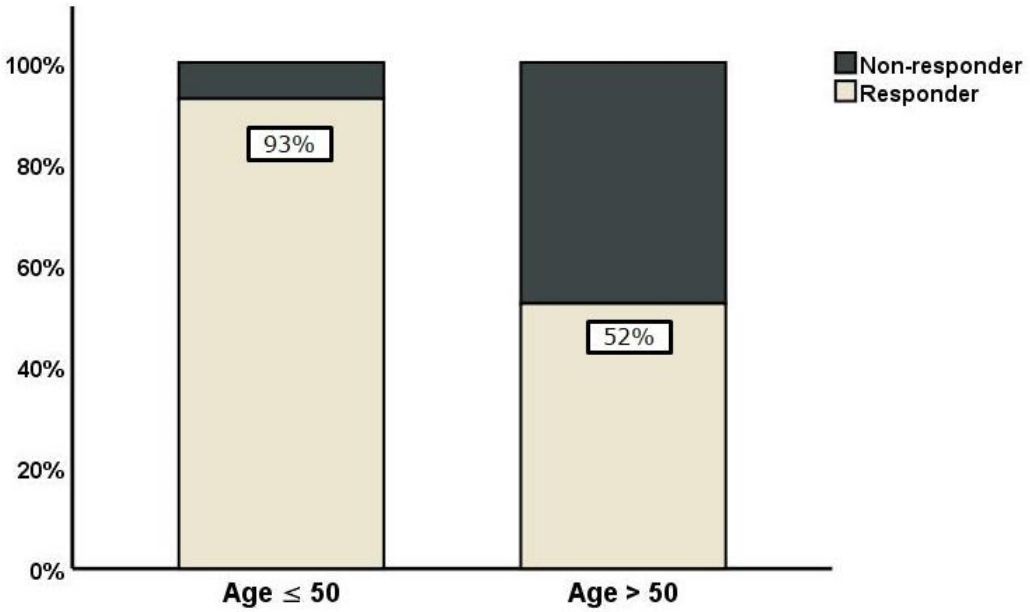

Figure 1 – Age and Seroconversion rate to hepatitis B vaccination.

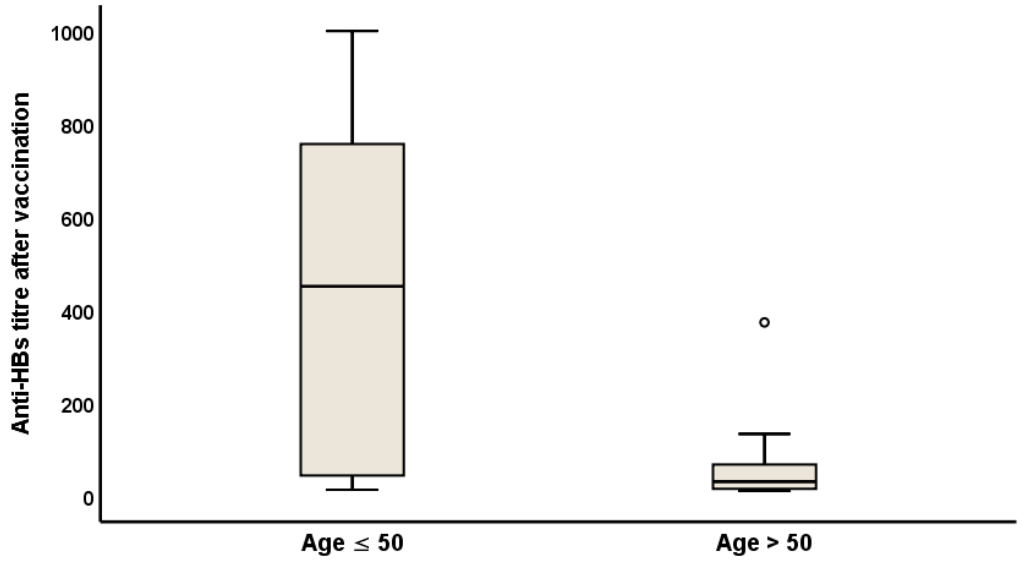

Figure 2 – Age and hepatitis B surface antibody (Anti-HBs) titre after vaccination.

ANEXO

Normas da Revista

PERITONEAL DIALYSIS INTERNATIONAL INSTRUCTIONS TO AUTHORS

GENERAL INFORMATION

Established in 1980, ***Peritoneal Dialysis International*** (PDI), the official journal of the **International Society for Peritoneal Dialysis** (ISPD), is the premier resource for nephrologists, nurses and fellows practicing PD throughout the world. PDI is published bi-monthly, plus special supplemental issues, in Print and Online format.

For more information about the journal, please visit our "About the Journal" page at www.pdiconnect.com.

AIMS & SCOPE

Peritoneal Dialysis International is an international publication dedicated to peritoneal dialysis. PDI welcomes original contributions dealing with all aspects of peritoneal dialysis from health care professionals and scientists working in the peritoneal dialysis field around the world.

BENEFITS OF PUBLISHING IN PDI

- Highest editorial standards and editing services to improve your accepted manuscript's accuracy, reliability, and readability
- Rapid publication through PDI in Press – original articles published online first within 8 weeks of acceptance
- Impact factor of 1.557 for 2017
- Indexed in major databases, including PubMed, MEDLINE, Science Citation Index
- Broad reach, with over 300,000 visits annually to PDI Connect, from over 160 countries
- Enhanced reader access with 4,800 recipients of electronic alerts (eTOC and PDI in Press)
- Open Access publication option for authors
- No author fees, including submission, extra page, publication or color charges. The only exception is a single $50 USD charge for online supplemental material
- Ability to post supplemental content online to enhance your article
- Articles are widely promoted through email notifications, newsletters, table of contents alerts and social media

EDITORIAL OFFICE CONTACT INFORMATION

Martin Wilkie, Editor-in-Chief
Sheffield Kidney Institute
Sorby Renal E Floor
Sheffield Teaching Hospitals NHS Foundation Trust
Herries Road
Sheffield, S5 7AU, United Kingdom
Tel: 0114 271 5327
E-mail: martin.wilkie@sth.nhs.uk

EDITORIAL AND PEER REVIEW PROCESS

Papers will be evaluated on the following criteria:

- Topic pertinent to the science or clinical practice of peritoneal dialysis
- Potential impact of the work that is being presented (similar work has not been published previously)
- The quality of the work - clinical studies will be evaluated on the basis of design, research methodology, data presentation and analysis, as well as the interpretation of results and discussion
- Meets appropriate research governance and publication code standards
- That the paper is clearly presented in written English and complies with layout guidelines in Instructions for Authors

Manuscripts are submitted through the *Peritoneal Dialysis International* ScholarOne Online management system (https://mc.manuscriptcentral.com/peritdialint). They are screened by the Editor in Chief within a few days of submission where a decision is made regarding initial suitability for peer review on the basis of quality, methodology, potential impact and research governance. Papers that pass this initial screening are allocated to the Associate Editors who will identify peer reviewers (usually 3 per article). Where papers are not considered suitable for peer review, authors will be notified promptly of the reason so that the work can be submitted elsewhere as appropriate. The average time from submission to first decision is 25 days –influenced by the complexity of

the paper and the availability of peer reviewers. Authors are blinded to the peer reviewers who have commented on their article; reviewers know the identity of the authors however. The progress of manuscripts can be tracked through the online ScholarOne submission system, or by emailing the editorial office. Authors are invited to submit the names and addresses of five or six individuals, who could, in their opinion, expertly review their manuscripts. The Editors, however, reserve the right to choose all reviewers.

MANUSCRIPT TYPES

The word, table and figure counts for an article are provided to keep manuscripts at a length that will maintain the interest of our reviewers and readership. Manuscripts that do not adhere to the allotments provided will be returned to the corresponding author for revision before undergoing peer review.

Original Articles: Peer reviewed investigations that represent new and significant contributions to the field. Maximum length 3500 words excluding abstract and references; 40 references; 5 figures and tables; abstract maximum 250 words presented as background, methods, results and conclusion. Content can be supplemented with online only material to be formatted by the author and uploaded with the article using the appropriate template. Where methodology is particularly extensive, more detailed information should be provided in the online only supplemental material. The main text of the paper must stand on its own without the supplemental material.

Reviews: Reviews of major areas or sub-areas in the field of peritoneal dialysis. These articles may be up to 4000 words in length and have 50 references, 6 tables and figures, brief descriptive abstract.

Commentaries: Views of invited authors on a specific topic where they are recognized experts. 2000 words, 30 references, no abstract.

Controversies and Hypotheses: Solicited by the editorial team, presented as point-counter point debates; limited to 3000 words total, 30 references, 6 tables and figures, brief abstract.

Clinical Guidelines and Consensus Statements: These are generally solicited through the International Society of Peritoneal Dialysis (ISPD) guidelines committee and are written by a working group of experts. Concise guideline statements supported by brief evidence will be supplemented by extensive evidence review presented as an online only supplement.

Short Reports: Brief clinical observations or pieces of original research. 1200 words including key references, 1 table and 1 figure. An unstructured abstract of 250 words maximum must be included.

Correspondence: Comments on papers published in PDI can be submitted through PDI's website www.pdiconnect.com, using the "E-Letters" feature. This feature allows readers to respond directly online to articles viewed on the PDI website. These letters are screened by the Editorial Team before online publication. If your comment isn't related to a particular article, please email the Editor-in-Chief for direction.

Occasionally the editorial decision on a submitted article will be to suggest to the authors that the article should be resubmitted as a letter to the editor. These letters will be limited to 250 words in length, with 4 references.

Book Reviews: As solicited by the editorial office.

Journal Cover Images: Authors are invited to submit scientifically interesting and visually arresting cover images. To view examples of cover art, see http://www.pdiconnect.com/content/by/year. Illustrations need not be reprinted in the article but should be representative of the work. Appropriate consents, permissions and releases must be obtained where authors wish to include images of patients and any other individuals. Images should be original, and authors grant Multimed Inc., on behalf of the ISPD, the exclusive license to publish. Include a brief caption (50–60 words) and credit information (e.g., Image courtesy of...). Images should be 6 inches wide by 7.25 inches high. Files should be in JPG or TIFF format with a dpi of at least 300. Cover image files may be submitted by email to wilkieme@gmail.com.

EDITORIAL POLICIES FOR AUTHORS

Peritoneal Dialysis International follows the International Committee of Medical Journal Editors' (ICMJE) Recommendations for the Conduct, Reporting, Editing and Publication of Scholarly Work in Medical Journals, which can be found at http://www.icmje.org/. In addition, PDI has specific requirements for the articles it publishes.

AUTHORSHIP

Only those persons who contributed directly to the intellectual content of the paper should be listed as authors. Based on the ICMJE recommendations, Authors should meet all of the following criteria:

1. Substantial contributions to the conception or design of the work; or the acquisition, analysis, or interpretation of data for the work; AND
2. Drafting the work or revising it critically for important intellectual content; AND
3. Final approval of the version to be published; AND
4. Agreement to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Holding positions of administrative leadership, contributing patients, and collecting and assembling data, are not, by themselves, criteria for authorship. Other persons who have made substantial, direct contributions to the work but cannot be considered authors should be listed in the Acknowledgments section. Examples of those who might be acknowledged include a person who provided purely technical help, writing assistance, or a department chair who provided only general support. Because acknowledgment may imply endorsement by acknowledged individuals of a study's data and conclusions, the corresponding author must obtain written permission to be acknowledged from all acknowledged individuals.

When a large multi-author group has conducted the work, the group ideally should decide who will be an author before the work is started and confirm who is an author before submitting the manuscript for publication. All members of the group named as authors should meet all four criteria for authorship, including approval of the final manuscript, and they should be able to take public responsibility for the work and should have full confidence in the accuracy and integrity of the work of other group authors. They will also be expected as individuals to provide conflict-of-interest disclosures.

When a large, multi-center group has conducted the work, the group should identify the individuals who accept direct responsibility for the manuscript. These individuals should fully meet the criteria for authorship defined above. When submitting a group author manuscript, the corresponding author should clearly indicate the preferred citation and should clearly identify all individual authors as well as the group name. Other members of the group should be listed in the acknowledgements. The National Library of Medicine indexes the group name and the names of individuals the group has identified as being directly responsible for the manuscript.

ROLE OF THE CORRESPONDING AUTHOR

The corresponding author is the one individual who takes primary responsibility for communication with the journal during the manuscript submission, peer review, and publication process. Only one author can be the corresponding author. The role of the corresponding author is to:

- meet submission requirements and submit the manuscript to the journal
- ensure all authors have reviewed and approved the final version of the manuscript prior to submission
- ensure that all of the journal's administrative requirements are met – including submission of all required forms
- ensure the journal's ethical policies are met by all authors
- distribute decision letters, reviewer comments, and other messages from the journal, and distribute proofs among coauthors for review
- return corrections and ensure that all authors approve each version of the article
- be available after publication to respond to critiques of the work and cooperate with any requests from the journal for data or additional information should questions about the paper arise after publication.

SOURCES OF SUPPORT

Sources of outside support for research, including funding, grants, equipment, and drugs, must be named in the title page and in the Acknowledgment statement. The role of the funding organization, if any, in the collection of data, its analysis and interpretation, and in the right to approve or disapprove publication of the finished manuscript must be described in the Methods section of the text.

Any involvement of medical writers/researchers, particularly those employed or supported by the pharmaceutical industry, in the writing of an article must be clearly defined and disclosed and also included in the Acknowledgment statement.

You are requested to identify who provided financial support for the conduct of the research and/or preparation of the article and to briefly describe the role of the sponsor(s), if any, in study design; in the collection, analysis and interpretation of data; in the writing of the report; and in the decision to submit the article for publication. If the funding source(s) had no such involvement then this should be stated.

CONFLICT OF INTEREST

Public trust in the scientific process and the credibility of published articles depend in part on how transparently conflicts of interest are handled during the planning, implementation, writing, peer review, editing, and publication of scientific work. A conflict of interest exists when professional judgment concerning a primary interest (such as patients' welfare or the validity of research) may be influenced by a secondary interest (such as financial gain). Perceptions of conflict of interest are as important as actual conflicts of interest.

Financial relationships (such as employment, consultancies, stock ownership or options, honoraria, patents, and paid expert testimony) are the most easily identifiable conflicts of interest and the most likely to undermine the credibility of the journal, the authors, and of science itself. However, conflicts can occur for other reasons, such as personal relationships or rivalries, academic competition, and intellectual beliefs. Agreements between authors and study sponsors that interfere with the authors' access to all of a study's data or that interfere with their ability to analyze and interpret the data and to prepare and publish manuscripts independently may represent conflicts of interest, and should be avoided.

All authors must disclose if any conflict of interest exists, or declare if they have none. The Conflict of Interest Disclosure is required for all manuscripts and will be published. It is the responsibility of the corresponding author to ensure that all co-authors adhere to this policy and to confirm whether they have any conflicts to declare.

The following statement must be included in your submitted manuscript file at the end of text, before the

references section, under the heading "Conflict of Interests Disclosure".

> "I/We have read and understood *Peritoneal Dialysis International's* policy on conflicts of interest disclosure and declare the following interests: [list them or state that you have none]."

Examples:

No competing interests

"We have read and understood *Peritoneal Dialysis International's* policy on disclosing conflicts of interest and declare that we have none"

Competing interests disclosed

"We have read and understood *Peritoneal Dialysis International's* policy on disclosing conflicts of interest and declare the following interests: AA has received speaker fees from BBB company. CC has received fees as an advisory board member for DDD company. EE's institution receives funding from FFF Company for a trial in which he is co-investigator."

In order to assist authors in the formation of their disclosure statements, and to help standardize authors ' disclosures across journals, we recommend that all authors download and complete a copy of the disclosure form, which is available as a PDF at http://www.icmje.org/downloads/coi_disclosure.pdf. It is not mandatory to complete this form, but encouraged. A summary statement derived from the information provided in section 6 of the form can be provided to the corresponding author.

DUPLICATE PUBLICATION AND CONCURRENT SUBMISSION

Duplicate publication is publication of a paper that overlaps substantially with one already published, without clear, visible reference to the previous publication. On the title page, give full details on any possible previous or duplicate publication of any content of the paper. Any reference to or use of previously published material must be explicitly acknowledged in the manuscript and the authors must obtain permissions where necessary. Previous publication of a small fraction of the content of a paper does not necessarily preclude it from being published, but the Editors need information about previous publication when deciding how to use space in the Journal efficiently; they regard failure of full disclosure by authors of possible prior publication as a breach of scientific ethics. Please send a copy of any document that might be considered a previous publication.

Duplicate or redundant submission is the same manuscript (or the same data) that is submitted to different journals at the same time. International copyright laws, ethical conduct, and cost effective use of resources require that readers can be assured that what they are reading is original. Manuscripts that are submitted to *Peritoneal Dialysis International* should not have been previously published or under consideration elsewhere.

Authors should be advised that Multimed is a member of CrossCheck's plagiarism detection initiative, and uses software to randomly scan accepted articles for duplication of text from previously published sources. Editors may also initiate a scan of any submitted manuscript during the review process, if duplicate publication or text recycling (self-plagiarism of an author's own publications) is suspected. Any article displaying more than a 15% level of duplication (excluding references) will be investigated and further action will be decided upon by the Editor on a case-by-case basis. Editors handle cases according to the guidelines outlined by the Committee on Publication Ethics (COPE) (http://publicationethics.org/) for duplicate publication and plagiarism.

INFORMED CONSENT

Patients have a right to privacy that should not be infringed without informed consent. Identifying information, including patients' names, initials, or hospital numbers, should not be published in written descriptions, photographs, and pedigrees unless the information is essential for scientific purposes and the patient (or parent or guardian) gives written informed consent for publication. Informed consent for this purpose requires that a patient who is identifiable be shown the manuscript to be published. Authors should disclose to these patients whether any potential identifiable material might be available via the Internet as well as in print after publication. Identifying details should be omitted if they are not essential. Informed consent should be obtained if there is any doubt that anonymity can be maintained. For example, masking the eye region in photographs of patients is inadequate protection of anonymity. If identifying characteristics are altered to protect anonymity, such as in genetic pedigrees, authors should provide assurance that the alterations do not distort the scientific purpose. When appropriate, authors must state in the Methods section the procedure used to ensure adherence to ethical guidelines on informed consent and should affirm that such consent was obtained.

If your article contains a case description of an individual patient, you must confirm on submission that you have obtained fully informed, voluntary and written consent to publish from the patient. If the patient is deceased or incapable of providing informed consent, you should have obtained consent from their next-of-kin, beneficiary or legal guardian.

HUMAN AND ANIMAL RIGHTS

When reporting experiments on human subjects, authors should indicate whether the procedures followed accord with the ethical standards of the responsible committee on human experimentation (institutional and national) and with the Helsinki Declaration of 1975, as revised in 2008. If doubt exists whether the research was conducted in accordance with the Helsinki Declaration, the authors must explain the rationale for their approach and demonstrate that the

institutional review body explicitly approved the doubtful aspects of the study. When reporting experiments on animals, authors should indicate whether the institutional and national guide for the care and use of laboratory animals was followed.

MANUSCRIPT PREPARATION

Peritoneal Dialysis International follows the International Committee of Medical Journal Editors' (ICMJE) Recommendations for the Conduct, Reporting, Editing, and Publication of Scholarly Work in Medical Journals, which can be found at http://www.icmje.org/. Authors may refer to ICMJE's "Manuscript Preparation" guidelines in addition to the guidelines provided below.

GENERAL FORMAT

Write the body of the manuscript as concisely as possible, adhering to the word limits specified for the given manuscript category.

For section and subsection headings, please use the heading styles built into your word processing template.

LEVEL ONE HEADING

LEVEL TWO HEADING

If further divisions of the text are required, use inline headings:

In-line Heading Level One: Paragraph text ....

In-line Heading Level Two: Paragraph text ....

To facilitate the review process, manuscripts must be in Microsoft Word format. Double space all text, including references and figure legends, and allow adequate margins. Use a common typeface such as Verdana, Arial, Helvetica, or Times in 11 or 12 points. Special or mathematical characters and Greek letters that are not on a standard keyboard must be created by using the Symbol font. Pages should be consecutively numbered, beginning with "1" on the title page.

Focus on the content rather than the look of a submission. Simpler is always better. In running text, formatting other than the usual uses of italic, superscript, and subscript is discouraged. During the copyediting process all extraneous formatting will, in any case, be stripped from the file to ensure smooth intake into the layout program used by the typesetter.

All papers must contain the following items, when applicable:

- Title Page
- Abstract and Key Words
- Text
- Acknowledgments
- Disclosures
- References
- Figure Legends
- Tables

TITLE PAGE

The first page of the manuscript should include:

1. The Title of the article (80 characters maximum, including spaces);
2. A running title (30 characters maximum, including spaces);
3. The names of the authors (written as first name, initial(s), and surname). Correct: Jane A. Smith, Paul T. Jones, Theresa Ryan. Incorrect: J.A. Smith, P. Jones;
4. The affiliation(s) for each author. For each affiliation, include the name of the department (if any), the institution, the city, the province or state (if applicable), and the country where the work was done. Use superscript Arabic numerals to indicate which authors are associated with which affiliations;
5. *Acknowledgements:* These include grants, equipment, drugs, and/or other support that facilitated conduct of the work described in the article or the writing of the article itself;
6. Full details on any possible previous or duplicate publication of any content of the paper (if applicable);
7. The name, postal address, and e-mail address of the corresponding author;
8. The word count for the text only (excluding abstract, acknowledgments, disclosures, tables figure legends, and references);
9. The number of figures and tables; and
10. The details of supplemental online material.

ABSTRACT AND KEY WORDS

For Original Articles, include a structured abstract of no more than 250 words, with the following subheadings:

- Background
- Methods
- Results
- Conclusions (or Summary)

For Review Articles, Consensus Statements, Guidelines, and Short Reports, include an unstructured abstract of no more than 250 words that summarizes the objective, main points, and conclusions of the article.

Do not include abstracts for Editorials, Commentaries, and Correspondence.

After the abstract, list up to eight key words or phrases for indexing. The key words should be different from those used in the title. A list of key words is required for all Original Articles, Review Articles, Consensus Statements, Guidelines, and Short Reports. Key words are optional for Correspondence; Commentaries do not have key words. Present the key words in one paragraph, separated by semi-colons, with a period at the end. Only the first key word should be capitalized.

TEXT

Abbreviations and Symbols: Use abbreviations sparingly and keep to those commonly used in the field. All acronyms and initialisms are to be spelled out on first use in the abstract, the text, and in each table or figure, with the abbreviation following in parentheses. If the term is repeated less than four times in the text, all instances must be spelled out. Abbreviations used in the body of the article should be indicated in the abstract, tables, and figures, even if they are used only once or twice in these sections, spelling out the first instance.

Do not begin a sentence with an abbreviation. Spell the phrase out in full or rewrite the sentence. Do not explain abbreviations for units of measurement [3 mL, not 3 milliliters (mL)] or standard scientific symbols [Na, not sodium (Na)]. Do abbreviate long names of chemical substances and terms for therapeutic combinations, such as DNA. Abbreviate names of tests and procedures that are better known by their abbreviations than by the full name (VDRL test, SMA-12). Abbreviate units of measurement when they appear with numerals (measured in milliliters, but 10 mL). Use abbreviations in figures and tables to save space. Explain all abbreviations used in the figure legend or table footnote.

Units of Measurement: Use SI units throughout. When units other than SI units are widely used, they can be indicated in parentheses after the SI unit. The editorial office will provide conversion information with the article when appropriate.

Proprietary and Generic Names: Generic names must be used for all drugs. Include the proprietary name in the following cases: if it is more commonly known than the generic name; to differentiate among drug forms; if a specific trade preparation was used in a study or involved in an adverse effect. If the proprietary name is used, the name and location of the manufacturer must be given in parentheses in the text. Instruments may be referred to by proprietary name; the name and location of the manufacturers must be given in parentheses in the text.

Use of English Language: All papers are published in English, and authors who are not fluent in English are advised to seek editorial help before submitting their papers. This will help to ensure that the academic content of the paper is fully understood by the journal editors and reviewers.

Organization: Organize the text using the applicable structure from the list set out here.

Original Articles: Introduction, Methods, Results, Discussion, Conclusions, Acknowledgments (optional), Disclosures, References, Figure Legends, and Tables. Additional descriptive subheadings may be used if appropriate.

Review Articles: Introduction, Text (may include Results and Discussion), Conclusions or Summary, Acknowledgments (optional), Disclosures, and References.

Short Reports: Introduction, Materials and Methods or Case Report, Results (omit for Case Reports), Discussion, Acknowledgments (optional), References, Figure Legends, and Tables. Authors may insert a short summary/conclusion section following the discussion section if they wish. In some cases, results and discussions sections may more appropriately be combined than separated (at the author's discretion).

Correspondence: Letters dealing with published articles or matters of interest to researchers are invited. They should be short (no more 400 words, 1 figure, 1 table, 4 references). Where a published article is involved, the original author(s) will be invited to submit a response.

REFERENCES

References in the text are numbered consecutively using Arabic numerals in parentheses. The manuscript's reference list is numbered **consecutively**, using Arabic numerals, in the order in which the references are first cited in the text. Citations appearing in tables and figures must fit into the numbering sequence from the point at which the table or figure is first mentioned in the text. PDI's citation style follows the Vancouver style, which should be selected if using reference handling software, such as EndNote.

Do:

1. number references in the order in which they are first cited in the text;
2. use Arabic numerals in parentheses;
3. use the reference style of the National Library of Medicine, including the abbreviations of journal titles, which should be abbreviated according to the style used in the list of Journals Indexed for MEDLINE, posted by the NLM on the Library's Web site (http://www.nlm.nih.gov/tsd/serials/lji.html);
4. include an "available from" note for documents that may not be readily accessible;
5. cite symposium papers only from published proceedings;
6. when citing an article or book **accepted** for publication but **not yet published**, include the title of the journal (or name of the publisher) and the year of expected publication;
7. when citing an article that has been published online but not yet in print, include the digital object identifier (doi); and
8. include references to unpublished material in the text, not in the references [for example, papers presented orally at a meeting; **unpublished** work (personal communications, papers in preparation)] and submit a letter of permission from the cited persons to cite such communications.

Do not use ibid. or op cit.

Sample References: The sample references below are based on the style specified by the Uniform Requirements agreement.

Journals: List all authors when six or fewer; when seven or more, list only the first six and add *et al.* (in italics).

Standard article
Vega KJ, Pina I, Krevsky B. Heart transplantation is associated with an increased risk for pancreatobiliary disease. *Ann Intern Med* 1996; 124:980–3.

Haag-Weber M, Kramer R, Haake R, Islam MS, Prischl F, Haug U, *et al*. Low-GDP fluid (Gambrosol trio) attenuates decline of residual renal function in PD patients: a prospective randomized study. *Nephrol Dial Transplant* 2010; 25:2288–96.

Corporate author
The Cardiac Society of Australia and New Zealand. Clinical exercise stress testing. Safety and performance guidelines. *Med J Aust* 1996; 164:282–4.

Supplement
Shen HM, Zhang QF. Risk assessment of nickel carcinogenicity and occupational lung cancer. Environ Health *Perspect* 1994; 102(Suppl 1):275–82.

Special format (also applies to abstracts and editorials)
Enzensberger W, Fischer PA. Metronome in Parkinson's disease [Letter]. *Lancet* 1996; 347:1337.

Books: List all authors or editors when six or fewer; when seven or more, list only the first six and add *et al.* (in italics).

Author
Ringsven MK, Bond D. *Gerontology and leadership skills for nurses*. 2nd ed. Albany, NY: Delmar; 1996.

Editors
Norman IJ, Redfern SJ, eds. *Mental Health Care for Elderly People*. New York, NY: Churchill Livingstone; 1996.

Chapter in a book
Phillips SJ, Whisnant JP. Hypertension and stroke. In: Laragh JH, Brenner BM, eds. *Hypertension: Pathophysiology, Diagnosis, and Management*. 2nd ed. New York, NY: Raven Press; 1995: 465–78.

Published proceedings paper
Bengtsson S, Solheim BG. Enforcement of data protection, privacy and security in medical informatics. In: Lun KC, Degoulet P, Piemme TE, Rienhoff O, eds. MEDINFO 92. Proceedings of the 7th World Congress on Medical Informatics; 6–10 September 1992; Geneva, Switzerland. Amsterdam: North-Holland; 1992: 1561–5.

Other Citations in Reference List

In press (must have journal title)
Leshner AI. Molecular mechanisms of cocaine addiction. *N Engl J Med* 1996; [In press].

Publish-ahead-of-print
Smith J. Important science breakthrough. *J Thght* 2009; Epub ahead of print. doi: 10.1186/s12906-015-0739-8

Magazine article
Roberts JL. Villain or victim? Newsweek. 1996; 4 Nov:40–1.

In-Text Citations of Unpublished Material (to be placed within parentheses)

Personal communication
(Strott CA, Nugent CA. Personal communication).

Unpublished papers
(Lerner RA, Dixon FJ. The induction of acute glomerulonephritis in rats. In preparation.)

(Smith J. New agents for cancer chemotherapy. Presented at the Third Annual Meeting of the American Cancer Society, 13 June 1983, New York, NY)

TABLES

Authors are asked to keep each table to a reasonable size; very large tables packed with data simply confuse the reader and may be included as Supplemental Material (see below). Similarly, try to minimize the use of abbreviations, and if abbreviations must be used, use well-known and accepted forms to minimize the need for the reader to constantly refer to the table legend. The same data should not be presented in both a table and a figure.

Tables are to be numbered using Arabic numerals in the order in which they are cited in the article text. Tables should also have a title (above the table) that summarizes the whole table; it should be no longer than 15 words. Every table column and row should be provided with an explanatory title stub, with units of measure applicable to the row or column clearly indicated.

Tables must be formatted using the table tool in a word processing program to ensure that columns of data remain aligned when the file is sent electronically for review. The table should be formatted with a horizontal line above the column title stubs, between the column title stubs and the table body, and at the end of the table body. Vertical lines, color, and shading are not to be used; parts of the table can be highlighted using symbols or bold text, the meaning of which should be explained in the table legend. Tables must not be embedded as figures or spreadsheet files.

Table legends follow the table body and should be as concise as possible. Footnotes follow the table legend and should be indicated using superscripted lowercase letters (a, b, c, and so on). Tables (together with their footnotes and legends) should be completely intelligible without reference to the text.

All tables (including their associated title, footnotes, and legends) should appear in consecutive numerical order after the references and any figure legends. All tables will be placed close to their text citations during article layout. All tables must be cited in the article text.

FIGURES

Format: Figures for reproduction should approximately fit within the typeset area of the journal. The following resolutions are optimal:

- Black-and-white line drawings, 600–1200 dpi

- Line drawings with some grey or coloured lines, 600 dpi
- Illustrations and photographs, 300 dpi

Authors should supply electronic versions of the figure content in EPS, GIF, TIFF, or JPEG format. Other formats, such PDFs, may be used, but are not preferred. Drawings made in Microsoft Word and PowerPoint are discouraged, because the display of such drawings varies with the settings of each computer used to view the file. There is no guarantee that such figures will reproduce exactly as intended by the author. Save each figure in a separate file without its title or legend, and use simple file-naming conventions (for example, Figure 1, Figure 2A).

Note About Color Figures: Please note that all figures are reproduced in black and white in the print version of the journal, unless color is requested by the authors. Colors in a figure that are of different hue but similar intensity might not be distinguishable when reproduced in shades of grey. It is the author's responsibility to ensure that colors used in figures are distinguishable when printed in black and white. Any figure that is to be printed in color should be specified by the author. There is no cost associated with color reproduction; however figures will only be printed in color when required for correct depiction.

Submission: All figures should be individually uploaded in the online submission process.

Figure Legends: Figures are to be numbered using Arabic numerals (1, 2, 3, and so on) in the order in which they are cited in the article text. If a figure has several panels, each panel should be identified using an uppercase alphabetic character (A, B, C, and so on). Each figure should have a title and an explanatory legend that clearly identifies the meaning of any symbols, arrows, numbers, or abbreviations used in the illustration. The legend should permit the figure to be understood without reference to the text.

Title and legend information for each figure should be included with the article text, grouped and placed at the end of the manuscript, after the reference list. All figures will be placed close to their text citations during article layout. Make sure that each figure is cited in the article text.

SUPPLEMENTAL MATERIAL

Authors may submit supplemental material to accompany their article for online-only publication when there is insufficient space to include the material in the print article. The material will be posted on the journal's website with the article, and may consist of data files, graphics, video or extensive tables. This material should be important to the understanding and interpretation of the report and should not repeat material in the print article. The amount of supplemental material should be limited and justified. The printed article must be complete and self-explanatory without the supplemental material. The material is intended to enhance a reader's understanding of the paper, but is not essential to that understanding. The material should be original and not previously published.

How to Supply Supplemental Material: Supplemental material will undergo editorial and peer review with the main manuscript. If the manuscript is accepted for publication and if the material is deemed appropriate for publication by the editors, it will be posted online at the time of publication of the article as additional material provided by the authors. This material will not be edited or formatted; thus, authors are responsible for the accuracy and presentation of all such material. Files cannot be altered, nor new supplemental information added, after the paper has been accepted for publication unless requested by the Editorial Office.

Supplemental material, with the exception of audio and video, should be submitted in a single Word document. The first page of the document must be the journal's standard cover page, which can be downloaded from https://mc.manuscriptcentral.com/societyimages/peritdialint/Supplemental%20Materials%20Template_2015.docx . The cover page should include the article title, authors, listing of supplemental files and corresponding author information. Each element included in the material should be cited in the text of the main manuscript (eg. Supplemental Figure 1) and numbered in order of citation in the text (eg. Supplemental Table 1, Supplemental Table 2, Supplemental Figure 1). Supplemental material should be uploaded with your manuscript.

Formatting requirements for each supplemental material type are outlined below:

Supplemental Text: Supplemental text should be set in Times New Roman font, 10 point in size, and single-spaced. The main heading of the online-only text should be in 12 point and boldface; subheadings should be in 10 point and boldface.

References: All references cited within the supplemental document must be included in a separate reference section, including those that also were cited in the main manuscript. They should be formatted just as in the main manuscript and numbered and cited consecutively in the supplemental material.

Supplemental Tables: Supplemental tables should be inserted in the document and numbered consecutively according to the order of citation as Supplemental Table 1, Supplemental Table 2, etc. See also instructions for tables above. If a table runs on to subsequent pages, repeat the column headers at the top of each page. Wide tables may be presented using a landscape orientation.

Supplemental Figures: Supplemental figures should be inserted in the document and numbered consecutively according to the order of citation as Supplemental Figure 1, Supplemental

Figure 2, etc. See also instructions for figures above. Wide figures may be presented using a landscape orientation.

Video: Submit videos according to the following specifications:

- Acceptable file formats: .mov, .wmv, .mpg, .mpeg, .mp4, or .avi
- Maximum file size: 10 MB
- Maximum length: 1 minute

Verify that the videos are viewable in QuickTime or Windows Media Player.

Authors will be notified if problems exist with videos as submitted and will be asked to modify them. No editing will be done to the videos at the editorial office. All changes are the responsibility of the author.

File name(s) should be one word with no spaces and the appropriate extension at the end. (eg. Video1.mov)

For each video, provide a citation in the appropriate place in the manuscript text and include a title (a brief phrase, preferably no longer than 10 to 15 words) and a caption at the end of the manuscript. In the video caption, specify the video file format and briefly describe the content of the video. If multiple video files are submitted, number them in the order in which they should be viewed.

If the author does not hold copyright to the video, the author must obtain permission for the video to be published in PDI. This permission must be for unrestricted use in all print, online, and licensed versions of PDI.

Audio: Please submit audio files according to the following minimum requirements:

- Acceptable file formats: .mp3, .wav, or .aiff
- Maximum file size: 10 MB
- To achieve the best quality, when saving audio files as an mp3, use a setting of 256 kbps or higher for stereo or 128 kbps or higher for mono
- Sampling rate should be either 44.1 kHz or 48 kHz
- Bit rate should be either 16 or 24 bit

For each audio, provide a citation in the appropriate place in the manuscript text. Ensure the audio is briefly described within the text (preferably no longer than 10 to 15 words).

File name(s) should be one word with no spaces and the appropriate extension at the end. (eg. Audio1.mp3).

Supplemental Material Fees: The author will be charged a fee of $50.00 US per file, which will be invoiced upon article acceptance. Payment must be made within 30 days.

PERMISSIONS

Please note it is the responsibility of the author(s) to obtain permission from the copyright holder to reproduce figures or tables that have previously been published elsewhere. This includes a full bibliographic reference to the original publication and an acknowledgement that the material is reproduced with permission from the rights owner within the legend. Authors are responsible for any permission fees requested by the copyright holder. The permission letter or proof should be supplied by the author along with their copyright transfer agreement or license to publish.

REPORTING GUIDELINES

Clinical Trials: The ICMJE defines a clinical trial as any research project that prospectively assigns human participants to intervention or comparison groups to study the cause-and-effect relationship between an intervention and a health outcome. PDI requires that all trials be registered and supports the position of the AllTrials.net Initiative in that we may still consider retrospectively registered trials if the exceptional circumstances of non-prospective registration are explained with a statement included in the methods section. For all trials, authors are asked to provide the trial registration information from an approved registry.

Authors of randomized trials are encouraged to adhere to CONSORT guidelines appropriate to their trial design. The manuscript should include a CONSORT flow diagram. The CONSORT checklist should be completed and submitted with the manuscript as a supporting file. To help ensure the study is appropriately indexed, authors should use the word "randomized" in the title. Authors must explicitly discuss informed consent in the manuscript and PDI reserves the right to request further details.

Observational Studies: Observational studies including case control, cohort, and cross-sectional studies. Authors are encouraged to adhere to the STROBE Statement and include a completed checklist as a supporting file.

Systematic Reviews and Meta-Analyses: Reports of systematic reviews and meta-analyses should adhere to the PRISMA Statement or alternative guidelines appropriate to the study design, and include the flow diagram within the manuscript and the completed checklist as a supporting file.

Diagnostic Studies: Authors of studies of diagnostic accuracy are encouraged to adhere to the STARD requirements or alternative guidelines appropriate to the study design and include a completed checklist as a supporting file.

Animal Studies: Authors of studies including animals are encouraged to adhere to the ARRIVE guidelines and include a completed ARRIVE checklist as a supporting file.

Survey Research: Manuscripts reporting survey data should use data collected as recently as possible, ideally within the past 2 years. Surveys should have sufficient response rates to ensure that nonresponse bias does not threaten the validity of the findings. In addition, authors should submit the survey instrument itself which might be published as an online-only supplemental file.

SUBMISSION OF PAPERS

All manuscripts must be submitted online at https://mc.manuscriptcentral.com/peritdialint. If visiting from www.pdiconnect.com, click on "Submit to PDI". Type your existing login/password, or click on "Create an account". Be careful not to create more than one account for yourself. The same account will be used whether you are submitting or reviewing a manuscript. You can make changes to your account at any time, once you are logged in. Once logged in you will also have access to different centers. To submit your manuscript, click on "Author Center" and follow the instructions. If you require assistance during the submission process, click on "Get Help Now" in the upper right hand corner.

Additional resources for online submissions assistance:

- Scholarone manuscripts – Author Guide (http://mchelp.manuscriptcentral.com/gethelpnow/training/author)

All components of the manuscript must appear within a single Microsoft Word document file. References, figure legends, and tables are to appear at the end of the manuscript. Figures and supplemental files are to be uploaded as separate files during the online submission process.

At time of submission, we request that the authors provide at least three potential reviewers. These reviewers should not have published with any of the co-authors during the past five years and should not currently work or collaborate with one of the institutes of the co-authors of the submitted manuscript.

REVISIONS OF PAPERS

When you prepare a revised version of your manuscript, it is essential that you carefully follow the instructions given in the Editor's email regarding preparation of the same. Failure to do so will cause a delay in the review of your revision and may result in return of the revision to you, without review, for proper preparation. If a revision is not received within 3 months after requested, your file may be closed.

PROOFS AND PUBLICATION

COPYEDITING

After final acceptance of your manuscript, it will be copyedited before publication to conform to *Peritoneal Dialysis International*'s style and usage. This editing may be substantive. It is the responsibility of the corresponding author to read the copyedited manuscript he or she will receive and to answer all queries fully.

PROOFREADING

The corresponding author will receive an email with the PDF file of the proof. The email includes instructions for correcting and returning the proof using Adobe Reader. If using the PDF annotations function is not feasible, corrections can be listed with corresponding page, paragraph and line number and returned via email. Please return the proof within 72 hours. You will not receive second proofs, so it is important to ensure that all necessary corrections are made any queries are answered. Authors should take extra care to ensure that all author details and affiliations are correct and complete.

COPYRIGHT

Authors submitting manuscripts to *Peritoneal Dialysis International* do so with the understanding that if a manuscript is accepted, the copyright of the article, including the right to reproduce the article in all forms and media, shall be assigned exclusively to the International Society for Peritoneal Dialysis. The corresponding author will be required to sign a "Copyright Transfer Agreement" on behalf of all authors. This must be completed and returned to the Editorial office before an accepted article can be published in the journal. PDI allows authors to retain a number of nonexclusive rights to their published article. See the "Copyright Transfer Agreement" or "Author Rights" for details.

Authors of accepted manuscripts may choose to pay an article processing fee in order for their article to be published open access, where articles are made freely available upon publication. See "Open Access Option for Authors".

AUTHOR RIGHTS

As an author, you are granted specific rights for a large number of author uses, which are granted and permitted without the need to obtain specific permission from the copyright holder, the International Society for Peritoneal Dialysis. The article must be properly cited (i.e., author name(s), journal name, copyright year, volume number, inclusive pages, and copyright holder). These author rights are granted and apply only to articles for which you are named as the author or co-author. The author rights include:

- The right to reuse figures or tables created by the authors and contained in the article in other works created by them, provided it is not for commercial use;
- The right to include the article in full or in part in a thesis or dissertation, provided that this not published commercially;
- The right to make copies and distribute copies of the article to research colleagues, for the personal use by such colleagues (but not commercially or mass distribution (e.g. Email list);
- Patent and trademark rights and rights to any process or procedure described in the article;
- The right to use the article or any part thereof in a printed compilation of works of the author, such as collected writings or lecture notes (following publication of the article in the Journal and provided that it is not for commercial use);
- The right to reuse portions or excerpts in other works provided there is full acknowledgment of its original publication.

OPEN ACCESS OPTION FOR AUTHORS

Authors of accepted manuscripts may have their articles made freely accessible on the journal's website immediately upon final publication by paying an open access fee. Please note that early online publication of articles through "PDI In Press (Publish Ahead of Print)" is not final publication. Final publication refers to the final version of articles published in an issue. Authors should carefully consider which license they choose and whether or not it meets their funder's requirements. Once an article has been published under a particular creative commons license, this license cannot be changed or revoked. After the funds have cleared, the final version of the article will be made open access.

Authors retain their copyright for all articles they opt to publish open access. Authors grant the ISPD a license to publish the article and identify itself as the original publisher.

The journal permits the following creative commons license types:

Creative Commons License Attribution-Non-commercial No Derivative 4.0 (CC BY-NC-ND)
(http://creativecommons.org/licenses/by-nc-nd/4.0/)

This license allows others to download your works and share them with others as long as they credit you, but they can't change them in any way or use them commercially.
Open Access Article Processing Fee = $2,750 USD

Creative Commons License Attribution 4.0 (CC BY)
(http://creativecommons.org/licenses/by/4.0/)

This license lets others distribute, remix, tweak, and build upon your work, even commercially, as long as they credit you for the original creation. This license may only be selected for authors funded by agencies that require CC BY License, such as Wellcome Trust (UK) or Research Council (UK).
Open Access Article Processing Fee = $3,200 USD

Upon article acceptance, authors may decide whether to publish and make article available through subscription or open access. Authors that are interested in the open access will be asked to download and complete our "License to Publish Agreement" and "Open Access Article Processing Fee Payment Form" upon article acceptance.

Authors who received funding from agencies with open access publishing requirements may meet their funding requirements by selecting the applicable open access option. The journal will make a reasonable effort to help authors comply with these requirements; however, ultimately it is the responsibility of the authors. The journal will authorize public posting on PMC and PMC mirror sites immediately upon publication in an issue, and the Open Access Article Processing Fee is received.

SELF-ARCHIVING POLICY

SUBSCRIPTION-BASED ARTICLES

Authors wishing to deposit the copyedited, page formatted, or final version of articles into a repository may do so (1) once they purchase the Open Access option for authors and (2) once the final version of the article has been published online as open access. The final version is the version that is published in an issue and not the "publish ahead of print" version(s). Any version of an article deposited into a repository/archive must give acknowledgement to the original source of publication, and a link back to the article's official version of record on the journal's web site, www.pdiconnect.com.

OPEN ACCESS ARTICLES

Authors who select the open access option for their article are entitled to deposit their accepted manuscript or final published version, to an institutional repository, his/her own website, and/or centrally organized repositories (including PubMed Central), immediately upon publication, provided there is an acknowledgement to the original source of publication, and a link back to the article's official version of record on the journal's website, www.pdiconnect.com.

The journal encourages authors to deposit the published version instead of the accepted manuscript. This will guarantee that the final version is readily available to those accessing your article from such repositories, and that your article is more likely to be cited correctly.

REPRINTS

A reprint order form accompanies the page proofs, so authors may order reprints prior to publication. Authors may also order reprints after publication. Reprints in color are also available at an additional charge. Contact Heather Seunath (heather_seunath@multi-med.com) for more information.